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the taller specimens derive no adventitious support from this source."

A copious appendix at the end of the volume, which, by the way, is neatly illustrated, embodies, together with much other matter, valuable notes on the flora of Morocco and the Canaries, together with meteorological and geological information in a condensed form. We take pleasure in commending the work to our readers, feeling sure that it will meet with their approval.—*W. W. B.*

THE SERIES OF ANIMAL FORMS IN GEOLOGICAL TIME.[1]—In this work Prof. Gaudry brings together from his stores of palæontological knowledge the evidences of serial relation in time presented by various groups of *Mammalia*. Following in the steps of Kowalevsky (Palæontographica, 1873) and Cope (Journal Philadelphia Academy Sciences, 1874), he takes up the history of each portion of the skeleton separately, and although he does not exhaust the subject, he treats it more fully than either of the authors named. The volume is divided in correspondence to the orders of *Mammalia*, and in each division the characters of the skull and skeleton, of the feet and of the teeth are taken up successively. Prof. Gaudry's classification, it must be admitted, is somewhat antiquated, for he adopts the "orders" *Pachydermata* and *Solipeda*, including in the former the hogs. Under the *Marsupialia* he describes the interesting French genera of the *Creodonta*, giving excellent figures of their teeth, which are very welcome. He does not appear to have been acquainted with the researches of Cope on these animals published in 1875[2] in which it was shown that they cannot be referred with any probability to the marsupials. Under the head of *Pachydermata* an interesting discussion of the origin of the present dental type of the *Rhinoceridæ* is found, that part relating to the outer crests of the molars being apparently new. The portion relating to *Palæotherium* and *Lophiodon* is especially useful. Prof. Gaudry treats the *Amblypoda* lightly, the principal expositions of the characters of the order by American palæontologists not having probably come into his hands at the time of writing his book. The discussion of the teeth and feet of *Ruminantia* is especially full, and good figures of the parts of several genera little known in America are given. One of the best chapters is that on the *Carnivora*, where the gradations in the dental characteristics of the genera are clearly shown. The extinct *Quadrumana* of Europe are very well illustrated, including the genera of *Mesodonta*, found in France. The author admits the suggestion of Filhol, that the latter "presentent, comme les *Adapis*, des passages entre les lémuriens et les pachydermes" (p. 230); a position which we think is quite indefensible. In this chapter Prof. Gaudry discusses the flints found by the Abbé Bourgeois in the Middle Miocene (Calcaires de Beauce) of Loir-et-Cher, concerning which opinions so differ. They are regarded as works of art by many archæologists, among whom are cited MM. de Vibraye, de Mortillet, de Quatrefâges, Hamy, etc., and the figures given by Prof. Gaudry are certainly favorable to this view. The great antiquity of the horizon is opposed to the belief that they could be the work of human hands, for the Calcaires de Beauce represent a horizon not much above the Oregon beds of our White river formation. As Gaudry remarks, no species of Mammal of that period still exists; and he adds, "it is not probable that the cutters of those flints remained the same amid universal change." His concluding words are as follows: "If then it is to be shown that the flints of the Calcaire de Beauce, collected by the Abbé Bourgeois have been cut, the idea which presents itself most naturally to my mind is, that they were fashioned by the *Dryopithecus*."

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[1] *Les Enchainements du Monde Animal dans les Temps Geologiques. Mammifers Tertiaires.* Par ALBERT GAUDRY. Paris, Savy, 1878. 8vo.

[2] Proceedings Academy of Natural Sciences, Philadelphia, December.

As a popular and at the same time scientific exposition of the succession of Mammalian forms, as displayed by their structural details, this book has no rival. The author has been led, like most other thorough students, to adopt the doctrine of evolution, and some of his reasons are here clearly set forth. The work is distinguished for the excellence of its engravings and typography.

RYDER ON THE MECHANICAL GENESIS OF TOOTH FORMS.[1]—In the several articles relating to this subject Mr. Ryder has made a valuable contribution to the doctrine of evolution. He adopts the classification of teeth proposed by Cope, and endeavors to explain by mechanical laws the succession or phylogeny of the various existing dental types pointed out by the same author. The application of mechanical theory to this question is ingenious, and results in some very probable hypotheses. First among these is the supposed effect of lateral pressure in flattening conical cones or cusps so that their section becomes semicircular or crescentic. Another is the probable crowding of tubercles on each other by impact transverse to their direction, producing plicate structure. His conclusions may be stated more in detail, and are as follows:

1st. That in *Carnivora* and *Omnivora* the jaws were simply opened and closed during mastication without lateral movement of the mandible or lower jaw, and that the earliest and most constant type of tooth accompanied this movement; that is, that the tubercles or cusps composing the teeth do not to any extent depart from the short-rooted type with conical tubercles, styled by odontologists bunodont. That the distance apart of the series of molars of opposite sides, of both upper and lower series, was

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[1] *On the Mechanical Genesis of Tooth Forms.* By JOHN A. RYDER. Proceedings of the Academy Natural Sciences, Philadelphia, 1878, p. 45. Further notes on do. Loc. cit., 1879, p. 47.